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(54) Method of Producing a Lining Part and a Lining Part Produced by This Method in Particular

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(57) A method of producing a lining part having a visible side and a rear side, wherein a blank part (14), which is already in its final shape in the no-load state but does not itself have dimensional stability, e.g., a preformed and/or profiled wooden veneer part, optionally having decoration, lettering or the like, is provided with a reinforcing layer on its rear side and is finished to have an at least partially transparent surface quality on its visible side by performing injection molding in a two-part injection mold consisting of a bottom mold and a top mold, characterized in that the blank part (14) is introduced first into a first top mold (12) in such a way that the visible side of the blank part is brought to rest against the mold surface of this first top mold, which corresponds essentially to the visible surface contour of the blank part; then the bottom mold (10), the mold surface of which is designed so as to form a first mold cavity (16), which corresponds to the desired dimensions of the reinforcing layer, on the rear side, is brought together with the first top mold (12); and then in a first injection molding step, the reinforcing layer is produced by injection molding a first plastic material as the rear side coating (18); then the bottom mold (10) with the semifinished product consisting of the blank part (14) and the rear side coating (18) remaining on it is released from the first top mold (12); then the bottom mold (10) is brought together with a second top mold (17) whose mold surface is designed so that a second mold cavity corresponding to the desired dimensions of the front side coating is formed on the visible side of the blank part, and finally in a second injection molding step, the front side coating (22) is produced by injection molding from a second plastic material.

This invention relates to a method of producing a lining or paneling part<sup>a</sup> which has a visible side and a back side; in this method a blank part which already has its final shape in the no-load state but which does not yet have any independent dimensional stability, e.g., a preformed and/or profiled wooden veneer part, optionally provided with decoration, lettering or the like, is provided on its rear side with a reinforcing layer and is equipped with an at least partially transparent front side coating of an optical surface quality by injection molding on its visible side in a two-part injection molding mold which consists of the bottom mold and top mold; this invention also relates to a lining part produced in particular by this method and consisting of a blank part such as a wooden veneer part or the like which is provided with a reinforcing layer on its rear side and with an at least semitransparent front side coating of an optical surface quality applied to its visible side by injection molding.

The object of the older German Patent Application P 41 24 297.1-16 (Unexamined German Patent 41 24 297, published subsequently) is a method of the type described above in which the edges and connecting points of the blank part and the reinforcing layer are sealed by means of a coating on the front side in the injection mold consisting of a bottom mold and a top mold. Until then, it was conventional to provide a high gloss lacquer<sup>b</sup> coating on the visible side of lining parts consisting, e.g., of a wooden layer, a fabric layer or film having a reinforcement on the rear side, but such a lacquer coating as that used in the older patent application is superfluous here because the front side coating can be produced directly in an optical surface quality in the injection molding process.

The procedure known until then for providing a lacquer coating consisted of the lacquer is applied to the respective blank part from the convex sides by spraying or spray coating after the blank part has been profiled, e.g., by bending. In general several layers are necessary to achieve the desired seal on the one hand but also on the other hand to obtain the glossiest possible surface. Suitable lacquers include those based on polyester or polyurethane, but in most cases it is also necessary to grind and polish the lining part after lacquering it. In addition, runs or bulges in the lacquer material which project laterally must be removed.

The disadvantage of this known procedure is not only that environmental problems occur because the lacquer enters the ambient atmosphere when sprayed but also in particular due to

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<sup>a</sup> Translator's note: "Auskleidung" also includes "trim" in a motor vehicle

<sup>b</sup> Translator's note: "Lack" is a broad term including lacquer, varnish, enamel and pigment lake.

the fact that it is impossible to protect the edges of the wood from penetration of moisture, so that any such protection must be provided in an additional operation.

On the other hand, the older proposal according to Unexamined German Patent 41 24 297 is characterized in that a perfect seal of the finished lining part is possible and environmental problems are largely avoided. With the method according to the older proposal, it is possible to obtain a high-gloss surface which does not require post-production grinding or polishing. It is possible to achieve complete protection of the edges in a single operation, because with a suitable design of the mold the coating can be extended to the rear side of the lining part. Thus, the surface is completely finished to the extent desired. The finished lining part has a high dimensional stability because no "free" drying operation is any longer necessary. No material is wasted because only the amount of material required for coating need be used. Preferably in the method according to the older proposal, a material which is liquid or liquefies at a temperature below the spontaneous ignition temperature of the blank part is used for the coating. Not only is this practical for manufacturing reasons but it also permits a subsequent separation of the coating from the blank part which thus makes it possible for these materials to be recycled. A liquefied coating can be removed from the blank part easily, e.g., by allowing it to drip off or by means of a centrifugal action.

The method according to Unexamined German Patent 41 24 297 has proven quite successful but production of the reinforcing layer which is introduced in a preshaped form together with the blank part into the injection mold in the known process entails problems and is relatively complicated.

Therefore, the object of this invention is to improve upon the generic method to the extent that production of a lining part consisting of a blank part, a front side coating and a reinforcing layer is simplified while at the same time quality is further increased. Furthermore, a lining part of an improved quality is to be produced.

According to this invention, this object is achieved with a method of the generic type by the fact that the blank part is first introduced into a first top mold, the visible side of the blank part being brought to rest against the mold surface, which corresponds essentially to the visible side of the surface contour of the blank part; then the bottom mold, whose mold surface is designed so that a first mold cavity, which corresponds to the desired dimensions of the reinforcing layer is formed on the rear side of the blank part, is brought together with the first top mold; then in a

first injection molding step, the reinforcing layer is produced by injection molding as a rear side coating using a first plastic material; then the bottom mold with the semifinished product consisting of the blank part and the rear side coating remaining in it is detached from the first top mold; then the bottom mold is brought together with a second top mold, the mold surface of which is designed so that a second mold cavity corresponding to the desired dimensions of the front side coating is formed on the visible side of the blank part; and finally in a second injection molding step, the front side coating is produced by injection molding using a second plastic material.

It is possible to provide here for the first plastic material and the second plastic material to be essentially identical.

However, according to this invention, the first plastic material may be different from the second plastic material.

According to this invention, it is also possible to proceed in such a way that the rear side coating and the front side coating are produced with essentially the same thickness.

Furthermore, this invention proposes using one or more plastic materials which are liquid or liquefied at a temperature below the spontaneous ignition temperature of the blank part.

According to this invention, it is also possible to proceed in such a way that when processing a blank part having at least one cutout, the mold halves that are used have mold surfaces such that the cutout in the first injection molding step remains free of the rear side coating, but in the second injection molding step, the cutout is lined continuously with the front side coating on its edges and extending as far as the rear side of the rear side coating.

Furthermore, according to this invention, due to an appropriate design of the mold surfaces of the bottom and/or top mold(s), all the edge areas of the blank part are lined with the front side coating at least as far as the rear side of the rear side coating.

Another embodiment of this invention is characterized in that the rear side coating is covered by the front side coating extending close to the edge areas.

According to this invention, it is also possible for the blank part to be provided with at least one function element such as a fastening element or the like on its rear side before the blank part is introduced into the first top mold.

As an alternative to this, it is also possible to provide for a function element such as a fastening element or the like to be introduced into the bottom mold and connected to the blank part in the first injection molding step.

5 According to this invention, it is also possible for the bottom molds and the top molds to be used with essentially vertically arranged mold surfaces and for the blank part to be clamped securely in the first to mold before performing the first injection molding step.

The lining or panel part according to this invention is characterized in that the reinforcing layer of the blank part is formed as a rear side coating by injection molding.

10 It is possible to provide here for the blank part to have at least one cutout passing completely through it.

According to the proposal of this invention, the front side coating may also cover the edge areas of the blank part at least up to the rear side of the rear side coating.

According to another embodiment of this invention, a lining part is characterized in that the front side coating covers the rear side coating close to the edge areas of the blank part.

15 It is also possible to provide here that the cutout corners or outside edge corners provided with the front side coating also have a radius of curvature of zero.

20 This invention is based on the surprising finding that it is possible to further improve upon the generic method and the lining part according to the older proposal as described in Unexamined German Patent 41 24 297 by also manufacturing the reinforcing layer of plastic material by an injection molding process. To do so, an injection mold is used which makes it possible to produce the rear side coating, optionally with the inclusion of function elements, in a first injection molding step in the manner claimed here, while then the front side coating is produced in the final optical surface quality by means of a second top mold in an injection molding step while retaining the same bottom mold. The first top mold is designed with respect to its mold surface so that the blank part is in tight contact with it so that in this first injection molding step, 25 only the mold cavity between the cavity and the top mold is filled with plastic material, whereupon then the first top mold is released. Then the semifinished product consisting of the blank part and the rear side coating, which functions as the reinforcing layer remain adhering to the bottom mold in this process. Then the second mold is used, its mold surface being designed

so that a second mold cavity is formed between it and the blank part, this second mold cavity then being filled with plastic material in the second injection molding step.

It is especially advantageous if the same layer thickness is used for the rear side coating and the front side coating because then a high resistance of the lining part thus produced with respect to alternating temperature stresses, i.e., a uniform dimensional stability is ensured. The layer thickness may be 0.3 to 3 mm, for example. Of course the plastic materials may be not only completely transparent but also pigmented, for example, to ensure the desired optical surface impression.

If the lining part is exposed to weather, it is advisable to use UV-resistant and/or weather-resistant materials as the plastic materials. Of course the plastic material should also be scratch resistant. Polymethyl methacrylates can be listed as the preferred plastic material. And of course the blank part may be not only a veneer part which has been optionally profiled and/or premolding such as a high-grade wood veneer which may be flat or curved and instead it is also possible to use blank parts made of metal or plastic. It is especially advantageous that cutouts can also be produced in the lining part and sealed with no problem, namely with freely selectable edge radii, in particular an edge radius of zero. To do so, the blank part is punched out or cut with a saw accordingly before being coated. Thus, it is a special advantage of this invention that radius-free cutouts or corners can be produced, such as those which are desirable for aesthetic reasons, e.g., for the installation of instruments in the dashboard of a motor vehicle.

Other features and advantages of this invention are derived from the following description where one exemplary embodiment is explained in greater detail on the basis of the schematic drawings, which show:

Figure 1 an exemplary embodiment of an injection mold that can be used according to this invention in a first injection molding step, shown in a cross section perpendicular to the plane of the lining part;

Figure 2 a diagram corresponding to that in Figure 1 illustrating the injection mold in a second process step, and

Figure 3 a diagram corresponding to those in Figures 1 and 2 showing a lining part produced according to this invention in a sectional view perpendicular to its main surface.

As shown in Figure 1, the injection mold according to this invention has a bottom mold 10 and a top mold 12. A preformed blank part 14 consisting of a wooden veneer part is clamped into the injection mold, which consists of the two mold halves 10, 12. A first mold cavity 16 is thus formed between the blank part 14 and the mold surface of the bottom mold 10.

In the case of the exemplary embodiment shown in Figure 2, the injection mold consists of the bottom mold 10 and a second top mold 17, a second mold cavity 20 being formed between the mold surface of the second top mold 17 and the blank part 14, which has now already been provided with a rear side coating 18 in a manner yet to be described below.

Figure 3 shows that the finished lining part consists of the blank part 14, the rear side coating 18 and a front side coating 22.

The method according to this invention is carried out in the exemplary embodiment shown here as follows: first the final shape is imparted to the blank part 14 in an installation outside of the injection mold, e.g., by embossing or the like, in which case it may be not only bent and curved but also provided with cutouts (by punching or sawing). Although this blank part 14 is already in its final form in the no-load state, it does not have dimensional stability under load, e.g., because it is designed to be very thin in order to save on materials (precious wood!).

Then the blank part 14 is placed in the first top mold 12, preferably by clamping it in position, the latter option being especially expedient in the case of mold surfaces that are arranged vertically. The mold surface of the first bottom mold 12 is designed so that the blank part 14 with its visible side facing down in Figure 1 is in tight and flush contact with the mold surface of the first top mold 12. Then the mold is closed by bringing the top mold 10 toward the first bottom mold 12 or vice versa, so that the first mold cavity 16 is formed between the rear side of the blank part 14 and the mold surface of the top mold 10. This mold cavity is then filled with plastic material in a first injection molding step, thus forming the rear side coating 18. Then the two mold halves 10, 12 are moved away from one another, so that the semifinished product consisting of the blank part 14 and the rear side coating 18 remains on the bottom mold 10.

Then the bottom mold 10 is brought together with the second top mold 17, with the mold cavity 20 remaining between the mold surface of the second top mold 17 and the visible side of the blank part 14, this mold cavity then being filled with plastic material in a second injection molding step. This forms the front side coating 22, which thus yields the final lining part according to Figure 3.

The features of this invention disclosed in the present description, the drawings and the claims may be important for the implementation of this invention in its various embodiments either used individually or in any desired combination.

#### List of Reference Numbers

10	10	Bottom mold
	12	First top mold
	14	Blank part
	16	First mold cavity
15	17	Second top mold
	18	Rear side coating
	20	Second mold cavity
	22	Front side coating



Patent Claims

1. A method of producing a lining part having a visible side and a rear side, wherein a blank part which is already in its final shape in the no-load state but does not itself have dimensional stability, e.g., a preformed and/or profiled wooden veneer part, optionally having decoration, lettering or the like, is provided with a reinforcing layer on its rear side and is finished to have an at least partially transparent surface quality on its visible side by performing injection molding in a two-part injection mold consisting of a bottom mold and a top mold, characterized in that the blank part is introduced first into a first top mold in such a way that the visible side of the blank part is brought to rest against the mold surface of this first top mold, which corresponds essentially to the visible surface contour of the blank part; then the bottom mold, the mold surface of which is designed so as to form a first mold cavity, which corresponds to the desired dimensions of the reinforcing layer, on the rear side, is brought together with the first top mold; and then in a first injection molding step, the reinforcing layer is produced by injection molding a first plastic material as the rear side coating; then the bottom mold with the semifinished product consisting of the blank part and the rear side coating remaining on it is released from the first top mold; then the bottom mold is brought together with a second top mold whose mold surface is designed so that a second mold cavity corresponding to the desired dimensions of the front side coating is formed on the visible side of the blank part, and finally in a second injection molding step, the front side coating is produced by injection molding from a second plastic material.
2. The method according to Claim 1, characterized in that the first plastic material and the second plastic material are essentially identical.
3. The method according to Claim 1, characterized in that the first plastic material and the second plastic material are different.
4. The method according to one of the preceding claims, characterized in that the rear side coating and the front side coating are produced with essentially the same thickness.
5. The method according to one of the preceding claims, characterized in that one or more plastic materials are used which are liquid or liquefy at a temperature below the spontaneous ignition temperature of the blank part.

6. The method according to one of the preceding claims, characterized in that when processing a blank part that has been provided with at least one cutout, mold halves are used which have mold surfaces such that the cutout remains free of the rear side coating during the first injection molding step but is lined continuously with the front side coating at its edges and as far as the rear side of the rear side coating in the second injection molding step.
7. The method according to one of the preceding claims, characterized in that all the edge areas of the blank part are lined with the front side coating at least as far as the rear side of the rear side coating due to an appropriate design of the mold surfaces of the bottom and/or top molds.
8. The method according to Claim 7, characterized in that the rear side coating is covered by the front side coating close to the edge areas.
9. The method according to one of the preceding claims, characterized in that the blank part is provided with at least one function element such as a fastening element or the like on its rear side before the blank part is introduced into the first top mold.
10. The method according to one of Claims 1 through 8, characterized in that a function element such as a fastening element or the like is introduced into the bottom mold and is attached to the blank part in the first injection molding step.
11. The method according to one of the preceding claims, characterized in that bottom molds and top molds having essentially vertically positioned mold surfaces are used, and the blank part is securely clamped in the first mold before performing the first injection molding step.
12. A lining part, produced in particular according to one of the preceding claims, comprising a blank part such as a wooden veneer part of the like which is provided with a reinforcing layer on its rear side and is provided with an at least partially transparent front side coating of an optical surface quality on its front side, this coating being applied by injection molding, characterized in that the reinforcing layer of the blank part (14) is formed as a rear side coating (18) produced by injection molding.

13. The lining part according to Claim 12, characterized in that the blank part (14) has at least one cutout running completely through it.

14. The lining part according to Claim 12 or 13, characterized in that the front side coating (22) covers the edge areas of the blank part (14) at least up to the rear side of the rear side coating (18).

15. The lining part according to Claim 14, characterized in that the front side coating (22) covers the rear side coating (18) close to the edge areas of the blank part (14).

16. The lining part according to one of Claims 12 through 15, characterized in that the cutout edges or outer edges provided with the front side coating (22) have a radius of curvature of zero.

# **European Patent Office** **EUROPEAN SEARCH REPORT**

European Patent  
Application EP 94 10 0803

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of the relevant passages	Relevant to Claim Number	CLASSIFICATION OF THE PATENT APPL. (INT. CL. 5)
Y	British Patent A 2,193,923 (Porter Lancaster) * Claims 8, 9 *	1, 3, 5, 7, 8, 12, 14, 15	B 29 C 45/16
Y	British Patent A 673 508 (Dacco) * page 2, line 13 - line 23; Claim 4, figures *	1, 2, 4, 7, 8, 12, 14, 15	FIELDS SEARCHED (INT. CL. 5)
Y	Patent Abstracts of Japan vol. 7, no. 269 (M-259) (1414) November 30, 1983	1, 3, 6, 11-13	B 29 C
Y	Database WPI Section Ch, week 9001, Derwent Publications Ltd., London, Great Britain class A11, AN 90-005502 & Swedish Patent A 8 704 538 (Kungsörs Plast AB) * abstract, figures *	1, 2, 4, 7, 8, 11, 12, 14, 15	
Y	Patent Abstracts of Japan vol. 8, no. 262 (M-341) (1699) November 30, 1984 & Japanese Patent A 59 133 028 (Dainippon Insatsu) * abstract *	1, 3, 12	
P, Y	Patent Abstracts of Japan vol. 17, no. 507 (M-1479) September 13, 1993 & Japanese Patent A 05 131 487 (Yamaha Corp) * abstract *	1, 3, 12	
D, P, Y	German Patent A 41 24 297 (Empe Werke Ernst Pelz) * the entire document *		
The present search report was prepared for all patent claims.			
Location of search: <b>THE HAGUE</b>	Date of completion of Search:  <b>April 26, 1994</b>	Examiner:  <b>J. Bollen</b>	
<p>CATEGORY OF DOCUMENTS CITED:</p> <p>X: document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>Y: document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>A: document defining the general state of the art which is not considered to be of particular relevance</p> <p>O: document referring to an oral disclosure, use, exhibition or other means</p> <p>P: document published prior to the international filing date but later than the priority date claimed</p>		<p>T: later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>E: older patent document, but not published until on or after the filing date</p> <p>D: document cited in the patent application</p> <p>L: document cited for other reasons</p> <p>_____ &amp;: corresponding document, member of the same patent family</p>	